Idaho Falls Subbasin Assessment and Total Maximum Daily Load

Diversion structure at Dry Bed along the South Fork Snake River, DEQ file photo

Final

Department of Environmental Quality

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1. Subbasin Assessment – Watershed Characterization

The federal Clean Water Act (CWA) requires that states and tribes restore and maintain the chemical, physical, and biological integrity of the nation's waters. States and tribes, pursuant to Section 303 of the CWA are to adopt water quality standards necessary to protect fish, shellfish, and wildlife while providing for recreation in and on the waters whenever possible. Section 303(d) of the CWA establishes requirements for states and tribes to identify and prioritize waterbodies that are water quality limited (i.e., waterbodies that do not meet water quality standards). States and tribes must periodically publish a priority list of impaired waters, currently every two years. For waters identified on this list, states and tribes must develop a total maximum daily load (TMDL) for the pollutants, set at a level to achieve water quality standards. This document addresses the waterbodies in the Idaho Falls Subbasin that have been placed on what is known as the "§303(d) list."

The overall purpose of this subbasin assessment and TMDL is to characterize and document pollutant loads within the Idaho Falls Subbasin. The first portion of this document, the subbasin assessment, is partitioned into four major sections: watershed characterization, water quality concerns and status, pollutant source inventory, and a summary of past and present pollution control efforts (Chapters 1 – 4). This information will then be used to develop a TMDL for each pollutant of concern for the Idaho Falls Subbasin (Chapter 5).

1.1 Introduction

In 1972, Congress passed the Federal Water Pollution Control Act, more commonly called the Clean Water Act. The goal of this act was to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (Water Pollution Control Federation 1987). The act and the programs it has generated have changed over the years as experience and perceptions of water quality have changed. The CWA has been amended 15 times, most significantly in 1977, 1981, and 1987. One of the goals of the 1977 amendment was protecting and managing waters to insure "swimmable and fishable" conditions. This goal, along with a 1972 goal to restore and maintain chemical, physical, and biological integrity, relates water quality with more than just chemistry.

Background

The federal government, through the U.S. Environmental Protection Agency (EPA), assumed the dominant role in defining and directing water pollution control programs across the country. The Department of Environmental Quality (DEQ) implements the CWA in Idaho, while the EPA oversees Idaho and certifies the fulfillment of CWA requirements and responsibilities.

Section 303 of the CWA requires DEQ to adopt, with EPA approval, water quality standards and to review those standards every three years. Additionally, DEQ must monitor waters to identify those not meeting water quality standards. For those waters not meeting standards, DEQ must establish TMDLs for each pollutant impairing the waters. Further, the agency must set appropriate controls to restore water quality and allow the waterbodies to meet their designated uses. These requirements result in a list of impaired waters, called the "§303(d) list." This list describes waterbodies not meeting water quality standards. Waters identified on this list require further analysis. A subbasin assessment and TMDL provide a summary of the water quality status and allowable TMDL for waterbodies on the §303(d) list. The *Idaho Falls Subbasin Assessment and Total Maximum Daily Load* provides this summary for the currently listed waters in the Idaho Falls Subbasin.

The subbasin assessment section of this report (Chapters 1 – 4) includes an evaluation and summary of the current water quality status, pollutant sources, and control actions in the Idaho Falls Subbasin to date. While this assessment is not a requirement of the TMDL, DEQ performs the assessment to ensure impairment listings are up to date and accurate. The TMDL is a plan to improve water quality by limiting pollutant loads. Specifically, a TMDL is an estimation of the maximum pollutant amount that can be present in a waterbody and still allow that waterbody to meet water quality standards (Water quality planning and management, 40 CFR 130). Consequently, a TMDL is waterbody- and pollutant-specific. The TMDL also includes individual pollutant allocations among various sources discharging the pollutant. The EPA considers certain unnatural conditions, such as flow alteration, a lack of flow, or habitat alteration, that are not the result of the discharge of a specific pollutants as "pollution." TMDLs are not required for waterbodies impaired by pollution, but not specific pollutants. In common usage, a TMDL also refers to the written document that contains the statement of loads and supporting analyses, often incorporating TMDLs for several waterbodies and/or pollutants within a given watershed.

Idaho's Role

Idaho adopts water quality standards to protect public health and welfare, enhance the quality of water, and protect biological integrity. A water quality standard defines the goals of a waterbody by designating the use or uses for the water, setting criteria necessary to protect those uses, and preventing degradation of water quality through antidegradation provisions.

The state may assign or designate beneficial uses for particular Idaho waterbodies to support. These beneficial uses are identified in the Idaho water quality standards and include:

- Aquatic life support – cold water, seasonal cold water, warm water, salmonid spawning, modified

- Contact recreation – primary (swimming), secondary (boating)

- Water supply – domestic, agricultural, industrial

- Wildlife habitats, aesthetics

The Idaho legislature designates uses for waterbodies. Industrial water supply, wildlife habitat, and aesthetics are designated beneficial uses for all waterbodies in the state. If a waterbody is unclassified, then cold water and primary contact recreation are used as additional default designated uses when waterbodies are assessed.

A subbasin assessment entails analyzing and integrating multiple types of waterbody data, such as biological, physical/chemical, and landscape data to address several objectives:

- Determine the degree of designated beneficial use support of the waterbody (i.e., attaining or not attaining water quality standards).

- Determine the degree of achievement of biological integrity.

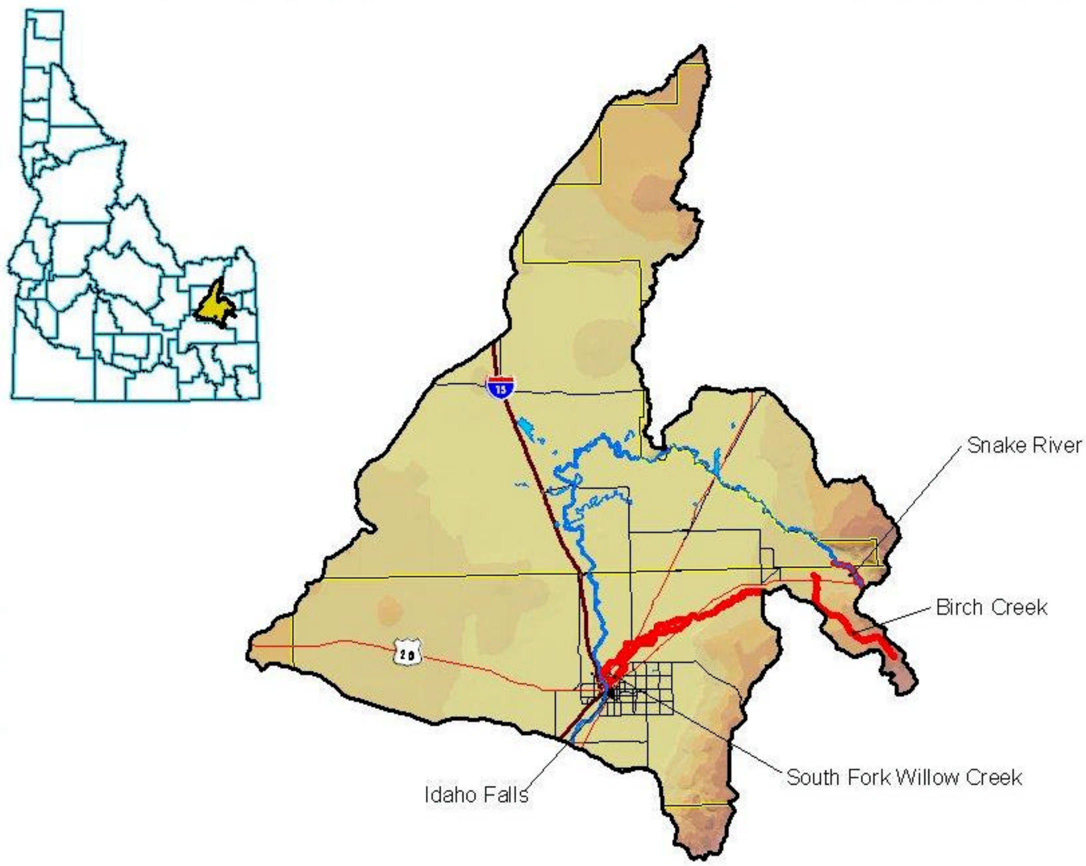
- Compile descriptive information about the waterbody, particularly the identity and location of pollutant sources.

- When waterbodies are not attaining water quality standards, determine the causes and extent of the impairment.

1.2 Physical and Biological Characteristics

The Idaho Falls subbasin (17040201) is located in eastern Idaho around the city of Idaho Falls (Figure A). The subbasin is comprised of a portion of the South Fork Snake River from Heise to the Henry's Fork, and a section of the main Snake River from the Henry's Fork confluence down to the diversion dams south of Idaho Falls. Other than the Snake River, there are very few natural waterways in the subbasin. Birch Creek, a natural drainage from the eastern foothills north of the Willow Creek subbasin, is considered water quality-limited for unknown reasons. Willow Creek, including the North Fork and the South Fork, below Ririe dam is listed as water quality-limited for sediment pollution; however, this waterway is an irrigation canal in this subbasin. More than three and one-half miles of the South Fork Snake River near Heise are listed as water quality-limited for flow alteration, a continuation of the listing of this river in the Palisades subbasin.

Figure A. Subbasin-at-a-glance - Idaho Falls Subbasin (17040201)



Climate

The climate of the Idaho Falls subbasin is classified as semiarid high desert characterized by warm to hot dry summers and long, cool winters. The Upper Snake River basin is primarily influenced by air masses moving inland from the Pacific Ocean during the winter months. In summer months, rainfall, cloud cover, and relative humidity are at a minimum due to the weakening of the westerly winds allowing continental climate conditions to prevail (Abramovich et al., 1998).

Precipitation throughout the subbasin varies widely (Table 1). The average is about 12.4 inches with a maximum of 27 inches along the Eastern Caribou Mountains, and a minimum of nine inches in western region of the subbasin (Figure 1). The majority of the precipitation in the basin occurs during the spring and fall months. The eastern boundary of the subbasin received the majority of the precipitation originating from orographic lifting along the edge of the Caribou Mountains along the Middle Rockies Mountain Range (USBR, 2001). The western portion of the subbasin is relatively flat, and precipitation in this region is mainly from low-pressure systems during late spring and autumn. Convection thunderstorms during spring and summer months also contribute to precipitation in the subbasin.

The annual average snowfall for the subbasin is approximately 38 inches, with majority of the snowfall occurring in December and January (see Table 1). Snow-pack tends to be greatest along the eastern boundary of the subbasin and decreases towards the West. Light snowfall begins in September in the higher elevations, but the lower elevations in the subbasin generally do not receive snow until October.

Maximum monthly temperatures climb to 87° F in July, the average warmest month, while minimum monthly winter temperatures drop to 4°F in January, the average coldest month (Table 2). The annual average maximum temperature is 58.6°F and the average minimum temperature is 26.4°F for the region. The growing season ranges from late May to early September with an average of 119 days (SCS, 1979).

Winds in the subbasin are mainly from the south-southwest (SCS, 1979). The highest average wind speed occurs in spring during March, April, and May with speeds of 20 to 30 mph for days at a time. The lowest wind speeds occur in the late summer during July, August, and September.

Table 1. Summary of precipitation data from three stations within the subbasin.

	Average Total Precipitation (in.)			Average Total Snowfall (in.)		
	Rexburg 7/77-12/00	Idaho Falls 5/52 – 12/00	Hamer 10/48-12/00	Rexburg 7/77-12/00	Idaho Falls 5/52 – 12/00	Hamer 10/48-12/00
January	1.09	1.03	0.58	13.3	8.3	6.9
February	1.10	0.94	0.49	11.1	5.3	5.2
March	1.09	1.03	0.59	4.1	3.2	2.7
April	1.15	1.10	0.74	2.4	0.5	1.1
May	2.02	1.68	1.41	0.6	0.4	0.4
June	1.47	1.30	1.25	0.0	0.0	0.0
July	0.97	0.59	0.75	0.0	0.0	0.0
August	0.72	0.76	0.73	0.0	0.0	0.0
September	0.81	0.84	0.60	0.2	0.0	0.1
October	1.05	0.94	0.60	0.9	0.4	0.8
November	1.17	1.00	0.66	8.0	3.3	3.5
December	1.05	1.04	0.63	16.2	7.1	7.8
Annual	13.71	12.25	9.03	56.9	28.5	28.5

Source: Western Regional Climate Center at http://wrcc.dri.edu/summary/climsid.html

Figure 1. Idaho Falls Subbasin Precipitation.

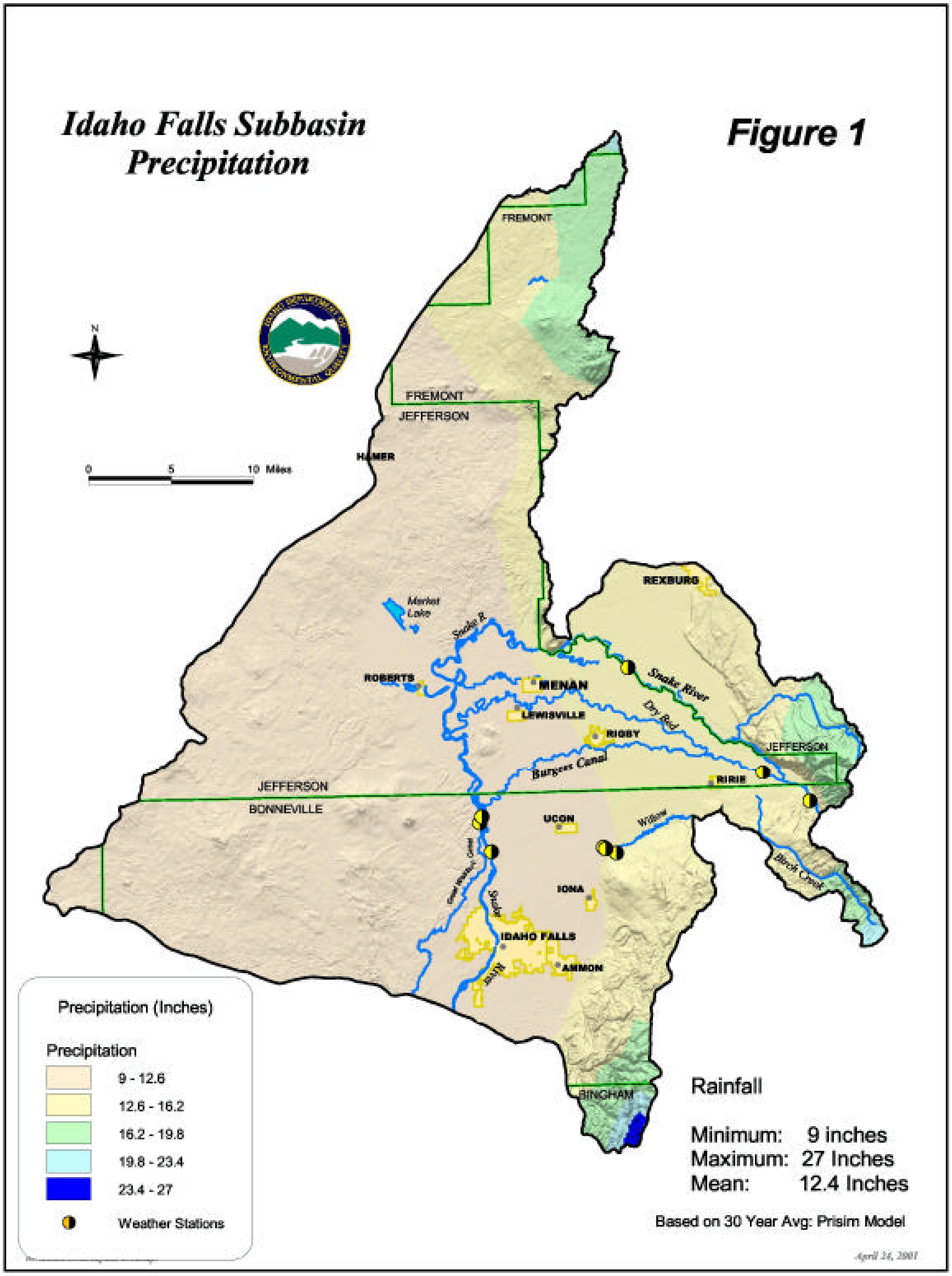


Table 2. Summary of temperature data from three stations within the subbasin.

	Average Max. Temperature (F)			Average Min. Temperature (F)		
	Rexburg 7/77-12/00	Idaho Falls 5/52 – 12/00	Hamer 10/48-12/00	Rexburg 7/77-12/00	Idaho Falls 5/52 – 12/00	Hamer 10/48-12/00
January	29.5	30.1	28.3	10.6	12.8	4.1
February	34.8	37.4	34.8	15.5	17.9	9.9
March	46.3	47.0	45.7	23.4	24.3	18.4
April	57.8	58.2	59.3	30.6	31.6	26.9
May	66.1	68.4	69.6	38.8	39.5	36.0
June	75.0	77.5	78.3	45.1	46.6	42.9
July	83.6	86.4	87.6	49.3	52.0	47.5
August	84.4	85.5	86.2	47.4	50.2	45.5
September	74.3	75.2	75.7	38.7	41.5	36.8
October	60.5	61.5	62.1	29.7	32.0	26.6
November	41.4	43.9	43.1	20.2	23.3	16.4
December	29.8	32.0	30.3	10.1	14.1	6.0
Annual	56.9	58.6	58.4	30.0	32.2	26.4

Source: Western Regional Climate Center at http://wrcc.dri.edu/summary/climsid.html

Subbasin Characteristics

Geology/Topography

The Idaho Falls subbasin is located on the eastern most edge of the Snake River Plain. The geology of the subbasin is generally comprised of Pleistocene lava flows on the western side and Pleistocene outwash flood and terrace gravels on the eastern side (Figure 2). The Snake River Plain consists of rhyolite erupting from a series of volcanoes beginning approximately 13 million years ago in the Western part of the state (Alt and Hyndman, 1989). Traveling eastward, the Snake River basalt gets progressively younger in age. The Snake River Plain ends at the Yellowstone Volcano, which is presently active. The surface of the Snake River Plain is covered with basalt, ranging from 10 to 50 feet thick, and is visible throughout the subbasin. Much of the Snake River basalt flows in this subbasin are overlain from soil blown into the region or from alluvium from the Snake River and its tributaries.

The Western portion of the subbasin is almost entirely the Snake River Plain basalt flows with moderately deep soils overlain (SCS, 1981). Among the vast basalt plain within the subbasin are several small buttes such as Kettle Butte, Shadduck Butte, and Butterfly Butte. Ephemeral drainage within this region of the subbasin sink through the porous lava into the Snake River Plain Aquifer.

The northern portion of the subbasin is dominated by the St. Anthony sand dunes. The St. Anthony dunes are the largest areas of sand dunes in Idaho, which spreads over approximately 175 square miles (Alt and Hyndman, 1989). The active portion trends northeast and is 35 miles long and five miles wide. The surrounding older portions are grass covered and stable. The dunes originate from quartz sand brought into the region by the

Snake River and blown from the floodplain into the dunes. During the winter months, the stiff southwesterly winds drive the horns and crests of the sand dunes consistently toward the northeast direction.

The topography of the subbasin is relatively flat as compared to other areas in Idaho. Elevations range from 4623 feet to 7252 feet with an average of 5030 feet (Figure 3). The highest elevations are located in the Southeastern Portion of the subbasin in the Willow Creek Hills along the Caribou Range.

The Caribou Range is located along the western flank of the Middle Rocky Mountains and is one of the basin and range complexes throughout Idaho and originated from the Jackson thrust fault along the Idaho-Wyoming border (Maley, 1987). Ascending along the Caribou Range is the Willow Creek Hills. The Willow Creek Hills are almost entirely made up of loess blown into the region. Soils in this area are very deep, well drained soils and are erosive (SCS, 1981). The soils are underlain with rhyolite, basalt, and a variety of sandstones and shales. Iona Hill, located East of Idaho Falls, is the major landmark of the Willow Creek Hills in this subbasin.

A corner of the Snake River Range falls within the Idaho Falls subbasin northwest of the Caribou Range. The Snake River Range is also part of the basin and range complex. Kelly Canyon, above the Snake River near Heise, is a part of this range.

Northwest of the Snake River Range is a large rhyolitic caldera called the Rexburg Caldera. It is believed to overlie granite crystallized from rhyolite magma that never reached the surface (Alt and Hyndman, 1989). On the edge of the Rexburg caldera where Henry's Fork and the Snake River join are the two Menan Buttes. The Menan Buttes are remnant of once active volcanoes. The largest is approximately 800 feet high with a crater 300 feet deep. It appears that the Buttes formed within a floodplain because of the presence of rounded pebbles mixed within the basalt cinders from the volcanoes. The buttes are younger than the Rexburg Caldera, indicating that they were associated with Basin and Range faulting that occurred in the surrounding areas.

Figure 2. Idaho Falls Subbasin Geology.

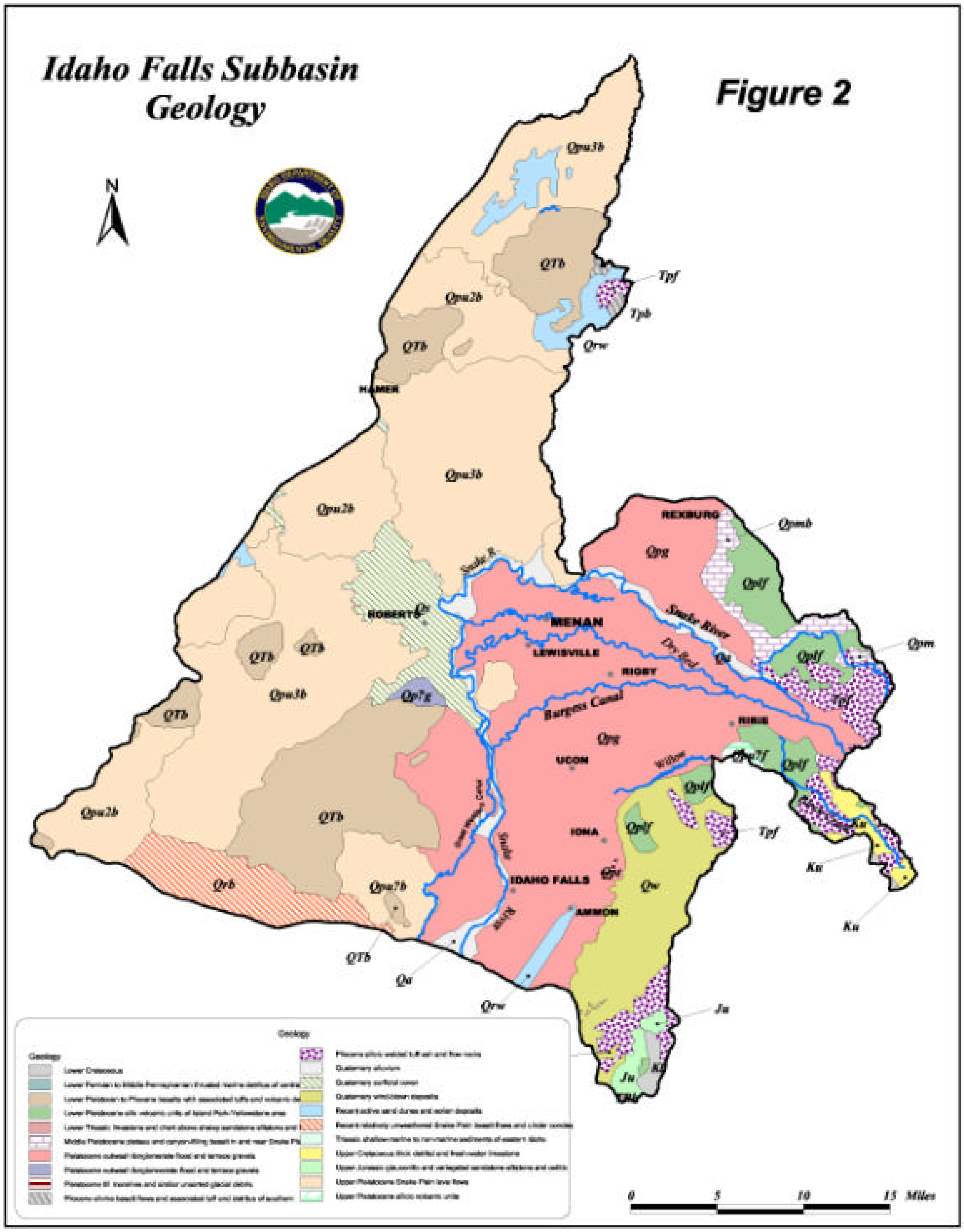
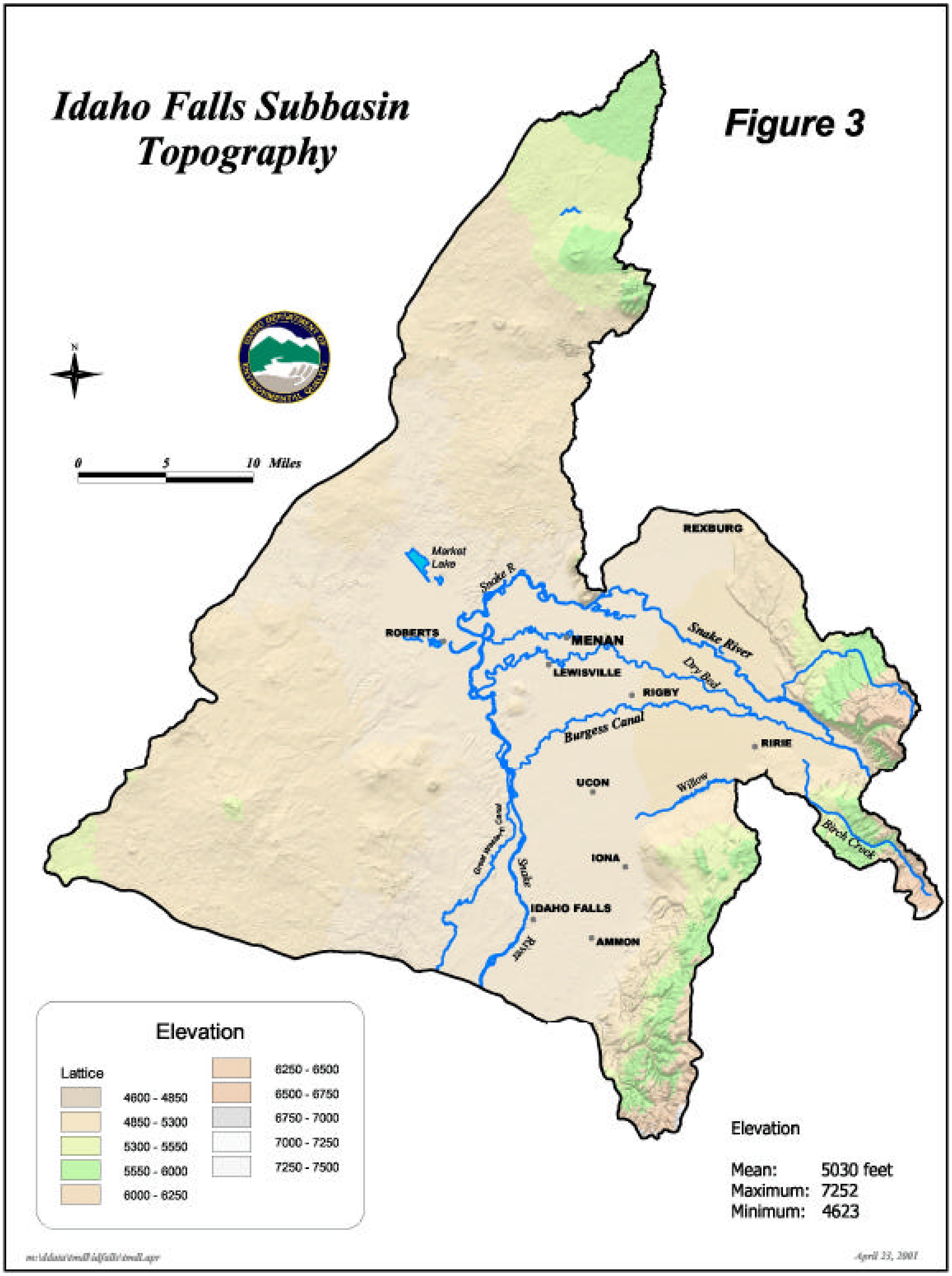


Figure 3. Idaho Falls Subbasin Topography.



Vegetation

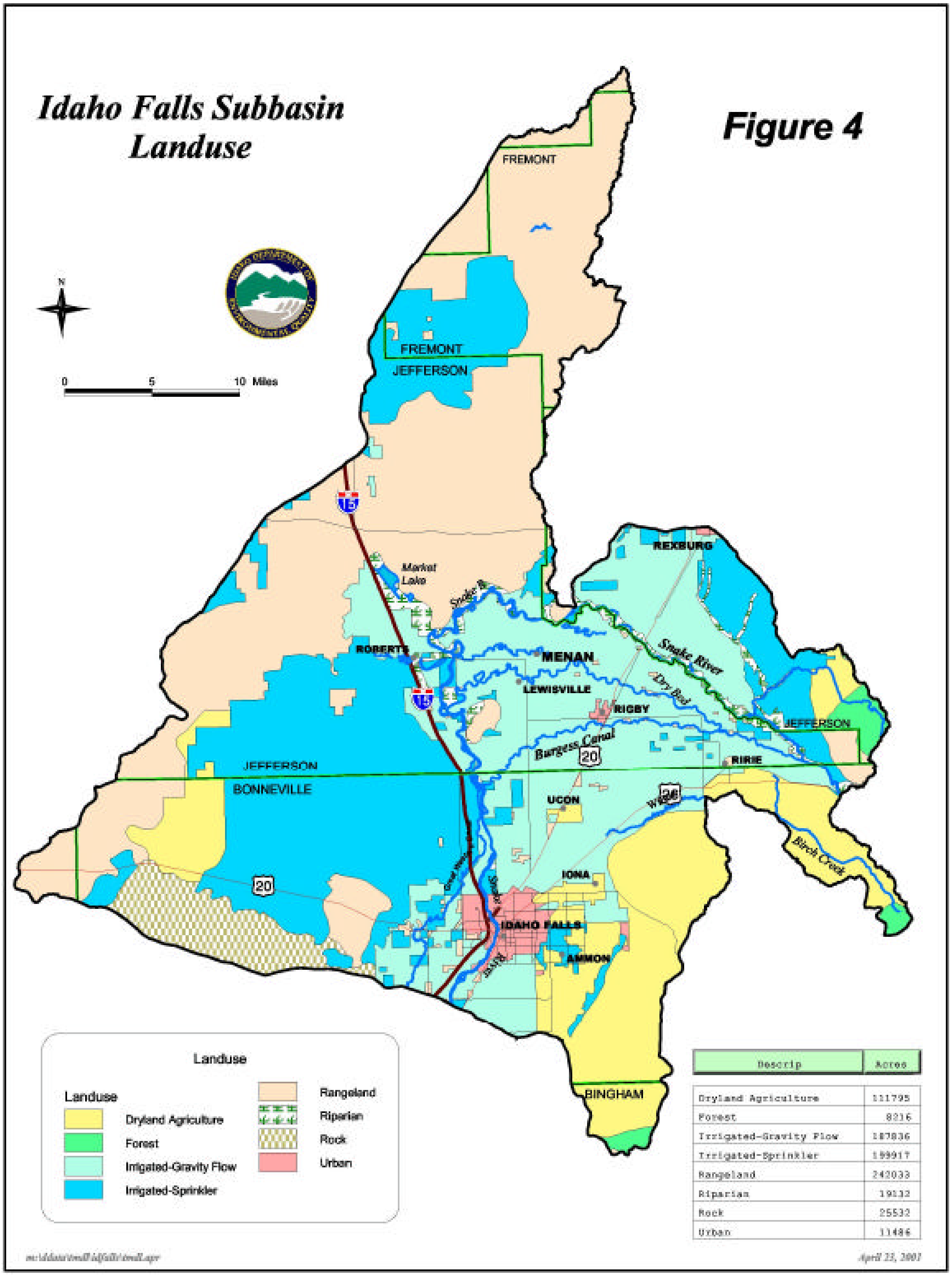
The Idaho Falls subbasin is largely an agricultural subbasin, the majority of which occurs in the southern two-thirds of the subbasin (Figure 4). However, the northern and western most extents of the subbasin are predominantly sagebrush shrublands (Figure 5). The shrublands are primarily made up of sagebrush-bunchgrass communities where Wyoming big sagebrush (*Artemisia tridentata ssp. wyomingensis*) and bluebunch wheatgrass (*Psuedoroegneria spicata*) predominate. Locally, other shrubs and grasses may predominate, including three-tip sagebrush (*A. tripartita*), winterfat (*Krascheninnikovia lanata*), green rabittbrush (*Chrysothamnus viscidiflorus*), thickspike wheatgrass (*Elymus lanceolatus*), Indian ricegrass (*Oryzopsis hymenoides*), needle-and-thread grass (*Stipa comata*), crested wheatgrass (*Agropyron desertorum*) and various bluegrasses (*Poa sp.*) (Anderson and Inouye, 1999). These areas once had abundant herbaceous species and wildflowers. Much of the species diversity has been reduced by many years of livestock grazing, altered fire cycles, and the invasion of annual exotic grasses.

This subbasin includes two vastly different features on the landscape, recent (Pleistocene) lava flows and sand dunes. Areas where lava flows are still evident are usually vegetated slowly as soil forms in the cracks and crevasses. Dominant vegetation on these flows include junipers (*Juniperus sp*.), fernbush (*Chamaebatiaria millifolium*), and Wyoming big sagebrush. The St. Anthony sand dunes are sparsely vegetated with grasses and a globally rare, but not imperiled (global priority 3 or G3) species of evening primrose (O*enothera psammophila*) known only in Idaho at these sand dunes in Fremont County.

There are a few pieces of coniferous forest vegetation in the upper Birch Creek drainage, the upper Kelly Canyon area, and on the slopes of Mount Taylor at the very southern tip of the subbasin. Also, in these same areas are isolated clumps of deciduous forest, primarily made up of quaking aspen (*Populus tremuloides*). Along the Snake River, especially in the Heise area, are areas of narrow-leaf cottonwood (*P. angustifolia*) gallery forest.

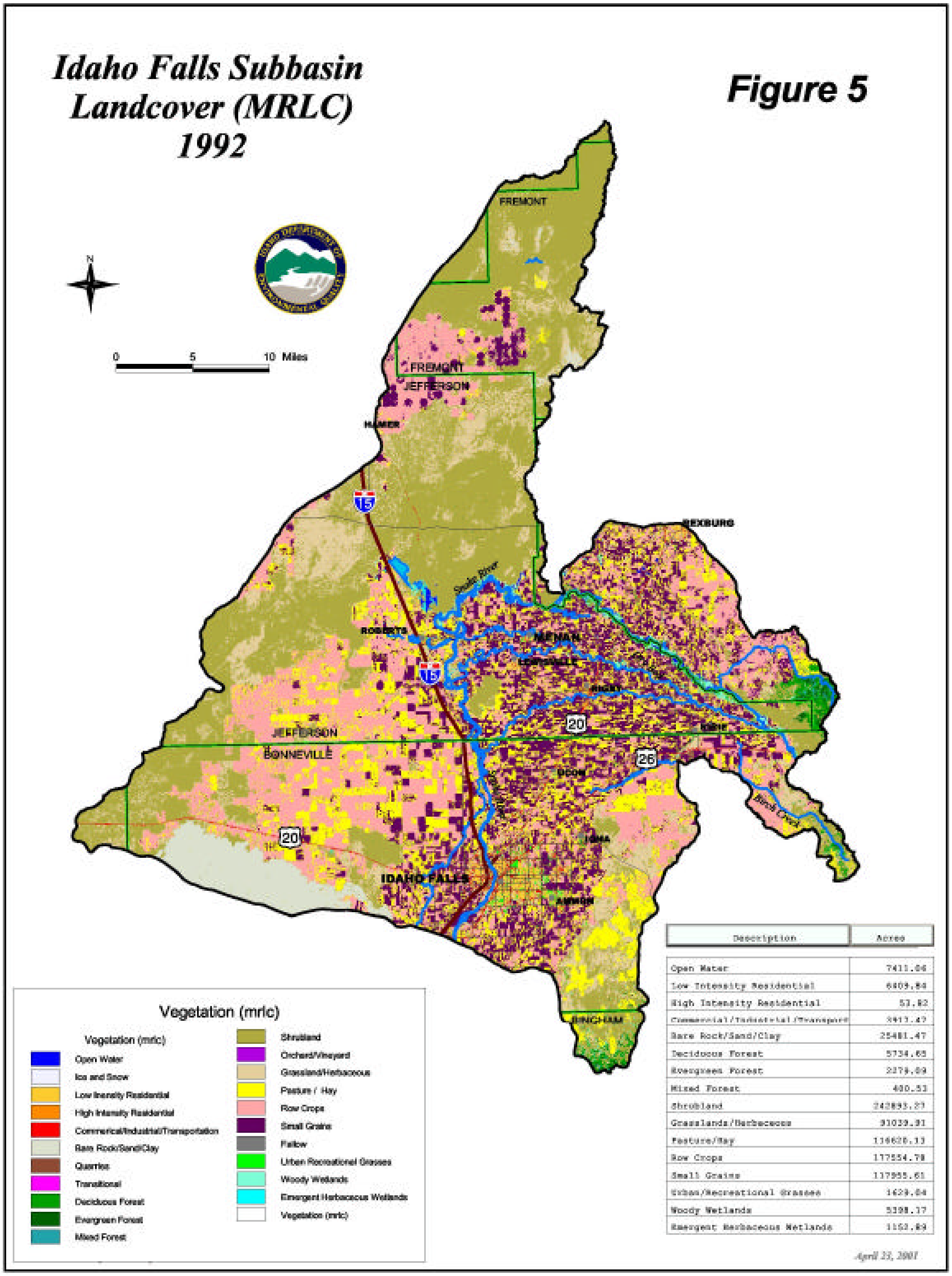
Riparian vegetation consists of a variety of facultative and obligate wetland plants including, willows (*Salix sp.*), red-osier doqwood (*Cornus stolonifera*), sedges (*Carex sp.*), and water birch (*Betula occidentalis*) and alders (*Alnus incana*) at higher elevations. The South Fork Snake River floodplain and possibly other floodplain areas are notable habitat for the rare orchid Ute Ladies' Tresses (*Spiranthes diluvialis*). This particular plant is ranked global priority 2 (G2), imperiled due to rarity or other factors that make it vulnerable to extinction. The US Fish and Wildlife Service has listed this species of orchid as "threatened."

Figure 4. Idaho Falls Subbasin Land Use.



Descrip	Acres
Dryland Agriculture	111795
Forest	8216
Irrigated-Gravity Flow	187836
Irrigated-Sprinkler	199917
Rangeland	242033
Riparian	19132
Rock	25532
Urban	11486

Figure 5. Idaho Falls Subbasin Land Cover.



Description	Acres
Open Water	7411.06
Low Intensity Residential	6409.84
High Intensity Residential	53.82
Commercial/Industrial/Transport	3913.47
Bare Rock/Sand/Clay	25481.47
Deciduous Forest	5734.65
Evergreen Forest	2279.09
Mixed Forest	400.53
Shrubland	242893.27
Grasslands/Herbaceous	91029.91
Pasture/Hay	116620.13
Row Crops	177554.78
Small Grains	117955.61
Urban/Recreational Grasses	1629.04
Woody Wetlands	5398.17
Emergent Herbaceous Wetlands	1152.89

Hydrology

Because major portions of the subbasin are piled thick with lava flows and sand dunes, very little surface drainage exists in the western and northern portions of the subbasin (Figure 8). The bulk of the hydrology results from the Snake River and an extensive network of canal systems that bring water to the agricultural fields of the central and southern portion of the subbasin. Additionally, several small drainages result from eastern mountains, including Lyons Creek, Kelly Canyon, Birch Creek, Taylor Creek, and Henry Creek. The Willow Creek drainage is a larger 6th order subbasin that discharges to the Idaho Falls subbasin below Ririe Reservoir.

Tables 3 and 4 show flow statistics for the major gages on the Snake River in and near the Idaho Falls subbasin. The average annual flow in the South Fork Snake River above Heise is about 7,500 cfs. After the major diversions of irrigation water near Heise, average annual flows have been reduced to about 4,500 cfs at Lorenzo. The most prominent diversion is Dry Bed, which carries flows throughout the year (Table 5).

The Henry's Fork contributes an average annual flow of about 2,100 cfs as measured at Rexburg. This added flow sends the Snake River average annual flow back up to about 6,500 cfs at Eagle Rock. Some additional diversions occur between Eagle Rock and Shelley so that average annual flow in the Snake River is about 6,000 cfs at Shelley.

Table 3. Annual flow (cfs) statistics for Snake River USGS gaging stations in and around the Idaho Falls subbasin.

Station Name and Number	Avrg. Annual Mean	Highest Annual Mean	Lowest Annual Mean	Highest Daily Mean	Lowest Daily Mean	Annual 7-day Min	Annual Runoff (Ac-Ft)
Snake River near Heise 13037500	7496	11590 (1997)	5188 (1993)	42900 (6/14/97)	902 (3/12/77)	932 (3/9/77)	5.431 million
Snake River at Lorenzo 13038500	4467	8813 (1997)	2431 (1989)	37800 (6/22/97)	110 (12/23/90)	118 (3/29/93)	3.236 million
Henry's Fork near Rexburg 13056500	2123	4134 (1984)	829 (1934)	79000 (6/5/76)	183 (3/24/34)	190 (3/22/34)	1.538 million
Snake River above Eagle Rock 13057155	6504	12880 (1997)	4004 (1988)	47900 (6/16/97)	950 (12/22/90)	1210 (12/19/90)	4.712 million
Snake River near Shelley 13060000	6024	12330 (1997)	1998 (1934)	50500 (6/7/76)	350 (11/5/34)	412 (11/2/34)	4.364 million

Table 4. Monthly mean flow (cfs) statistics for Snake River USGS gaging stations in and around the Idaho Falls subbasin.

Station #*	Stat.	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
13037500 (1971 to 2000)	Ave.	4022	2740	2824	2990	3150	5021	8225	13650	16590	14010	9287	7218
	Max.	8179	5758	6270	6233	10520	13760	16800	20550	31690	18690	11610	10160
	Min.	1666	1183	1064	1084	1040	983	1858	3951	11050	10230	6831	4341
13038500 (1924 to 2000)	Ave.	1490	1373	2003	2256	2283	3805	5755	8625	10260	7622	4361	3094
	Max.	3028	4277	5707	5976	9132	12900	13850	16750	26720	12220	6797	6213
	Min.	405	243	497	431	433	426	788	1761	4017	4297	2154	744
13056500 (1909 to 2000)	Ave.	1752	1904	1774	1706	1763	1772	2297	4113	3958	1679	1311	1521
	Max.	3071	3282	2663	2972	2701	2805	4847	10600	10220	5133	3986	2896
	Min.	377	440	1073	1100	1064	340	388	390	434	358	446	561
13057155 (1988 to 2000)	Ave.	3470	3706	3492	3672	4533	5860	7285	11990	14180	8634	6318	4866
	Max.	5884	6308	6560	7901	12100	16040	16260	24050	35400	14050	9863	7203
	Min.	2491	2323	1990	2034	2127	1987	2297	5642	6620	6061	4866	3703
13060000 (1915 to 2000)	Ave.	3165	3564	3662	3580	3827	4776	7663	12710	13420	7444	4773	3719
	Max.	9465	7841	8334	8210	11460	15150	19620	28240	34380	19650	9073	7682
	Min.	646	827	1584	1515	1599	1401	1559	3261	2432	2213	1342	1119

*Station names are in Table 1.

The Willow Creek/Sand Creek complex, once a volatile system prone to flooding, has now been reduced to a system of canals that receive water from Ririe Reservoir and the Snake River. The Ririe Dam was authorized by the Flood Control Act of 1962 after a devastating flood that same year covered an extensive area on the East Side of Idaho Falls (COE, 1972; BOR, 2001). Construction on the dam began in 1970 and was completed in 1977.

The dam controls the flow of water to Willow Creek and Sand Creek, which have been re-enforced with rip-rap and in many places straightened to function as irrigation canals. Water released from Ririe Reservoir into the Willow Creek/Sand Creek system is completely controlled (BOR, 2001). Additionally, a floodway bypass was built from a point on Willow Creek just downstream of the Willow Creek/Sand Creek diversion. The bypass canal takes excess floodwater straight west to the Snake River above the City of Idaho Falls.

Table 5 shows monthly flows from gaging stations on Willow Creek, Sand Creek, and the floodway bypass in 2000. During the non-irrigation season (December through March) no flows are recorded in these waterways. During the irrigation season (May through September) Sand Creek averaged from 300 to 500 cfs and Willow Creek averaged 100 to 150 cfs at respective gaging sites. The bypass carried some excess water (20-60 cfs) in spring (April – May), and then again (130-400 cfs) in fall (September – November).

Water rights information was obtained from the Idaho Department of Water Resources (IDWR), Idaho Falls Office (B. Contor. Personal Communication). Water rights for the Willow Creek and Sand Creek canal system are in Appendix A. Prior to adjudication, the database contained five decreed and licensed rights for 8.57 cfs of Birch Creek flow (Table 6). Currently, IDWR has received claims as part of the adjudication process for 4.95 cfs of Birch Creek from three parties.

Table 5. Monthly mean flow (cfs) statistics for canal USGS gaging stations for the 2000 water year (October 1999 to September 2000).

Station #*	Stat.	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
13038000	Ave.	1850	667	448	328	393	415	322	3841	4364	3975	3047	2500
	Max.	2360	730	582	346	402	470	1100	5070	4640	4440	3180	2790
	Min.	1130	571	333	219	320	227	0	1300	4130	3470	2750	1880
13057132	Ave.	162	0	0	0	0	0	96	122	102	144	163	184
	Max.	228	0	0	0	0	0	262	179	134	179	181	211
	Min.	0	0	0	0	0	0	0	75	77	114	144	154
13058510	Ave.	247	4	0	0	0	0	41.7	319	590	509	370	381
	Max.	341	101	0	0	0	0	145	557	665	624	415	402
	Min.	153	0	0	0	0	0	0	158	545	376	314	326
13058520	Ave.	367	133	0.03	0	0	0	25	52.1	0.1	0.2	0.3	193
	Max.	410	341	0.8	0	0	0	78	134	2.3	3.3	1.5	319
	Min.	329	4	0	0	0	0	0	0	0	0	0	0.1
13058529	Ave.	401	147	0.03	0	0	0	19	60	5	3	4	189
	Max.	451	367	0.9	0	0	0	90	175	13	7.7	11	310
	Min.	340	10	0	0	0	0	0	1.3	0.02	0	0.3	7.3
13058530	Ave.	65.7	0.4	0	0	0	0	16.6	98.9	149	159	138	134
	Max.	106	13	0	0	0	0	61	139	172	187	158	159
	Min.	30	0	0	0	0	0	0	60	133	130	130	100

*13038000 = Dry Bed near Ririe.
13057132 = Great Western Spillback canal near Idaho Falls.
13058510 = Sand Creek above Willow Creek diversion near Ucon.
13058520 = Willow Creek floodway channel near Ucon.
13058529 = Willow Creek floodway channel at mouth near Idaho Falls.
13058530 = Willow Creek below floodway channel near Ucon.

Table 6. Original database and adjudication claims water rights for Birch Creek.

Sequence No.	Basis	Status	Priority Date	Diversion (cfs)
Original Database				
1	Decreed	Active	6/1/1876	2
2056	License	Active	1/25/1915	0.5
2073	License	Active	n.d.	4
2155	License	Active	n.d.	n.d.
7141	License	Active	2/3/1978	2.05
12734	Decreed	Active	4/1/1910	0.02
Claims				
1	Decreed	Active	6/1/1876	2
7141	Permit	Active	2/3/1978	2.88
12734	Beneficial Use	Active	4/1/1910	0.07

Ririe Reservoir

The following has been excerpted from the Ririe Dam section of the US Bureau of Reclamation Pacific Northwest Region website:

http://dataweb.usbr.gov/dams/id00344.htm

General Description

"The Ririe Project was constructed to impound and control the waters of Willow Creek, a Snake River tributary in eastern Idaho, for flood control, irrigation, and recreation. Significant fish and wildlife protection measures also are included. Major features of the project include Ririe Dam and Lake, and a floodway bypass outlet channel."

Plan

"Ririe Lake, formed by the construction of Ririe Dam, serves a principal purpose of flood control on the lower reaches of Willow and Sand Creeks. Out of a total reservoir capacity of 100,500 acre-feet, 10,000 acre-feet is dead and inactive space, 80,500 acre-feet serves both flood control and irrigation, and the top 10,000 acre-feet is held exclusively for emergency flood control operations. Principal facilities of the Ririe Project include one storage dam with a total active capacity of 90,500 acre-feet and one floodway or outlet channel."

Ririe Dam and Lake

"Ririe Dam is located on Willow Creek, a minor tributary of the Snake River, in Bonneville County of eastern Idaho about 15 miles northeast of the city of Idaho Falls and about 4 miles southeast of the town of Ririe. The Corps of Engineers constructed the dam during the period 1970-1977. The dam is a zoned earth and rockfill structure with a structural height of 253 feet, a hydraulic height of 169 feet, and a crest length of 1,076 feet. The reservoir impounded by the dam has a total capacity of 100,500 acre-feet (active 90,500 acre-feet)."

"The outlet works consists of an intake structure, gate controlled outlet conduit, stilling basin, and service bridge. The water from the intake structure is discharged into a reinforced concrete conduit, and the conduit carries the water through the main dam to the stilling basin on the downstream side of the dam."

"The spillway is a gated two-bay concrete gravity structure. Each bay contains a 40.5-foot wide by 27.32-foot high radial (tainter) gate with no provisions for stoplogs. The spillway contains an ogee crest at elevation 5093 feet. The ogee crest is located immediately downstream from the bottom of the radial gates. The spillway is divided into three monoliths with construction joints at the centerline of the ogee crest."

"The Ririe Dam Project is a multiple-purpose development involving irrigation, flood control, and recreation. Significant fish and wildlife protection measures are also included. Major features include Ririe Dam, Ririe Reservoir, and an outlet channel which serves as a flood way to control project flood releases."

Floodway or Outlet Channel

"The floodway or outlet channel is a structure to control the water flow in Willow Creek below the dam, especially that section flowing through Idaho Falls and the area northeast of the city. Also controlled is Sand Creek as it flows east and southeast of Idaho Falls. Required releases of 1,900 cubic feet per second from Ririe Lake can be carried adequately in the natural channel to the point where the stream divides into Willow and Sand Creeks. The floodway bypass begins on Willow Creek just downstream from the point where Sand Creek branches from Willow Creek and extends directly west 7.8 miles to enter the larger natural channel of the Snake River 4.5 miles north of Idaho Falls. The bypass is gated at the Willow Creek intake to control initial inflow. The north bank of the channel was constructed at ground level to permit surface inflow of floodwaters along its course. Sand Creek can adequately carry 1,000 cubic feet per second and the floodway bypass channel was designed to carry 900 cubic feet per second, thereby providing the required additional capacity to control water flows."

Early History

"Since 1911, at least eight spring floods and nine winter floods have caused considerable damage in the area of Ririe and Idaho Falls. The largest known floods were those of 1917 and 1962. The 1917 flood was a spring snowmelt flood augmented by rainfall peaking at 4,200 cubic feet per second in Willow Creek near Ririe. Some 3,000 acres of land were inundated for 2 to 3 weeks. The 1962 flood was a winter rain flood augmented by frozen ground and snowmelt, peaking at 5,080 cubic feet per second in Willow Creek above its confluence with Sand Creek. About 54,000 acres were inundated for 2 to 3 days. Flows above 2,000 cubic feet per second that occur about 3.5 miles below the present damsite cause flooding conditions."

Investigations

"The review report on "Columbia River and Tributaries," dated June 1949, prepared by the Corps of Engineers and printed as House Document 531, 81st Congress, 2nd session, summarized field studies for storage and channel works on Willow Creek and indicated that flood control works were not economically feasible at that time. The Upper Snake River Basin report of 1961, prepared jointly by the Corps of Engineers and the Bureau of Reclamation, indicated that Ririe Dam and Reservoir warranted early construction. Interim Report No. 3, dated March 1962 and prepared by the Corps, presented additional information on structures and costs, economic analysis, and operating procedures. This report included a brief summary of the February 1962 flood, with comments on the control of such a flood by storage at the Ririe site."

Authorization

"Construction of Ririe Dam and Reservoir was authorized by the Flood Control Act of October 23, 1962 (76 Stat. 1193, Public Law 87-874). House Document No. 562 served as the basis for that authorization. Project purposes are irrigation, flood control, and recreation."

Construction

"Project construction was performed under the jurisdiction of the Corps of Engineers. Construction of the dam began in January 1970 and was completed in November 1977. Floodway channel work began in June 1975, and was completed in February 1978. Recreation area work was started in May 1977, and was completed in June 1979."

Flood Control

"Coordinated operation of Ririe Dam and the floodway bypass channel will control the flows in Willow and Sand Creeks to help alleviate flood damages such as those previously experienced in the city of Idaho Falls and on surrounding farmlands. The devastating floods of 1917 and 1962 were created by flows more than double the 2,000-cubic-foot-per-second capacity of Willow Creek. With the present control structures, Willow Creek can be contained at 1,900 cubic feet per second."

Irrigation

"In 1994, the United States entered into a contract with Mitigation, Inc., which provided that entity with noncontracted irrigation storage and space in Palisades (18,980 acre-feet) and Ririe (80,500 acre-feet) Reservoirs in order to protect existing non-Indian water users from adverse effects that might result from implementation of the 1990 Fort Hall Indian Water Rights Agreement and Fort Hall Indian Water Rights Act of 1990."

Recreation and Fish and Wildlife

"Four recreation areas have been developed to meet projected initial demands. Juniper Park, adjacent to the project headquarters visitor center, is the major recreation site. Both overnight camping and day-use facilities are available, including a floating fishing dock and a boat-launching ramp. Blacktail Park, on the lake, includes a swimming area and other day-use facilities. Benchland Park is also on the lake, but is accessible only by boat and has limited day-use facilities. Creekside Park has day-use facilities and access to Willow Creek just downstream from the dam. Ririe Lake is stocked annually with rainbow trout and the minimum reservoir pool

> provides winter habitat for fish survival and growth. A minimum flow of 25 cubic feet per second is maintained downstream in Willow Creek to provide stream fishing habitat. Deer and elk use the area as winter range, so a large area around the south half of Ririe Lake is developed as rangeland for support of these animals during the critical winter months."
>
> "The loss of wildlife habitat associated with the construction of Ririe Dam and Teton Dam led to the establishment of the Tex Creek Wildlife Management Area. In 1976 and 1977, the U.S. Army Corps of Engineers and the Bureau of Reclamation purchased 11,000 acres of critical big game winter range in the Tex Creek area just east of Idaho Falls, Idaho. The Idaho Department of Fish and Game eventually assumed additional critical acres."
>
> "Also, a cooperative agreement with the Bureau of Land Management resulted in the inclusion of 9,600 acres of land, and today, the Tex Creek Wildlife Management Area encompasses more than 28,700 acres. The entire area is managed for wildlife, with emphasis on big game."

Fisheries

Salmonids are found in the Snake River and in natural tributary drainages in the Idaho Falls subbasin. The Idaho Department of Fish and Game (IDFG) conducted creel census and population sampling through electrofishing in the mid-1980s on various sections of the Snake River (Lukens, 1988a; 1988b). In general, the most abundant salmonid below Henry's Fork is mountain whitefish followed by brown trout, cutthroat trout, wild rainbow trout, and some hatchery rainbow trout around the City of Idaho Falls (Lukens, 1988a). The lower South Fork and the main Snake River in the Idaho Falls subbasin are considered a brown trout fishery (W. Schrader, Personal Communication). Put and take hatchery rainbow trout are locally important around the City of Idaho Falls. Additionally, miscellaneous game fish were found in the section nearest the mouth of the Henry's Fork. These included yellow perch escaped from Market Lake, lake trout escaped from Palisades Reservoir, and rainbow x cutthroat hybrids (Lukens, 1988a). In the lower South Fork Snake River above Henry's Fork brown trout are again the predominant game fish (Lukens, 1988b). Lukens (1988a, 1988b) concluded that catch rates were lower in this subbasin of the Snake River as compared to upper Henry's Fork or upper South Fork, but growth rates were good suggesting that the area could be a productive game fishery if recruitment could be enhanced.

In 1999, the USGS (Maret, 1999) sampled a location on the South Fork Snake River just upstream from the Idaho Falls subbasin boundary. This electrofishing sampling effort obtained numerous mountain whitefish, as well as Yellowstone cutthroat trout, rainbow trout, rainbow x cutthroat hybrids, and brown trout. Also caught were some Utah sucker, longnose dace, speckled dace, and shorthead sculpin. IDFG has also sampled four sections of the South Fork Snake River (Palisades, Conant, Twin Bridges, and Lorenzo) periodically since 1986 (Schrader and Gamblin, 2001). The Lorenzo section within the Idaho Falls subbasin was last sampled in late September-early October of 1999. Of the 1,431 trout individuals caught by electrofishing, 76% were wild brown trout, 23% were wild cutthroat trout, and the remaining trout (<1%) were wild rainbow trout and hybrid trout. IDFG performed some recent (2000) sampling for cutthroat trout population estimates in the Menan section of the Snake River below Henry's Fork to compare to 1988 sampling data from the same area (W. Schrader, Personal Communication). These data have not been published yet, although raw data appear similar between the two years.

IDFG electrofished Birch Creek on November 11, 1980 (W. Schrader, Personal Communication). An actively spawning population of brook trout was found in the upper eight kilometers (5 miles) of that stream. Piute sculpin was the only other fish species found in Birch Creek during that sampling event. No fish were found in the lower sections of Birch Creek.

Although not in this subbasin, Corsi (1984) reported electrofishing data for tributaries in the Willow Creek drainage above Ririe Reservoir. He found cutthroat trout to be the most abundant salmonid in that drainage. Brown trout were also abundant and brook trout were locally important. Rainbow trout and rainbow x cutthroat hybrids were infrequently observed. Mountain whitefish are also present in the Willow Creek drainage along with a number of nongame species such as mottled sculpin, longnose dace, speckled dace, redside shiners, Utah chubs, Utah suckers, and mountain suckers. Because water is shut off to lower Willow Creek below Ririe Reservoir during the non-irrigation season (November -–April), it is unlikely that these populations of fish extend into the Idaho Falls subbasin. However, other natural drainages in the subbasin (Lyon Creek, Kelly Canyon Creek, Taylor/Henry Creeks) may have some of these fish species present.

Subwatershed Characteristics

The Idaho Falls subbasin is divided into ten fifth field sub-watersheds on Figure 8. Half of these sub-watersheds (17040201-01, -02, -03, -05, -07) include some portion of the Snake River. We have named the ten sub-watersheds below based on the most prominent feature on the landscape (city, waterbody, mountain, etc.).

Idaho Falls Sub-watershed (17040201-01)

This sub-watershed includes the City of Idaho Falls and that portion of the Snake River from the power plant below Payne to the southern boundary of the subbasin. This sub-watershed includes the upper portion of Sand Creek and associated canals on the East Side of the Snake River, and the Great Western Canal and the Oakland Canal/Martin Canal complex on the western side of the river. Also included are the 303d listed Willow Creek, including the North Fork and the South Fork, from its divergence with Sand Creek to the Snake River.

Watershed protection projects under PL-566 were completed for Upper Sand Creek (SCS and East Side SCD, 1984) and Lower Sand Creek (SCS, East Side SCD, and North Bingham SCD, 1985). The purposes of these plans were to provide effective land treatment plans for the control of soil erosion and sedimentation in agricultural fields above the Sand Creek Canal.

Rigby/Shattuck Butte (17040201-02)

This sub-watershed includes that portion the Snake River from where the Butte Market Lake Canal returns to the river near Bassett to the power plant near Payne. Drainages included in this sub-watershed are some minor (probably ephemeral) drainages southeast of Butterfly Butte and below Shattuck Butte, the Osgood Canal, the origin of the Great Western Canal and the Idaho Canal, and the Burgess, Wilkins, Randall, and Rudy Canals below Rigby.

Menan/Roberts (17040201-03)

This sub-watershed includes that portion of the Snake River from the confluence with the Henry's Fork to Bassett. The sub-watershed boundary slices southeast across Annis and Scotts Sloughs, Dry Bed, and other canals to an area just east of Rigby. Also on the East Side of the Snake River, Spring Creek, the Dry Bed return flow, and the towns of Menan and Lewisville are located in this sub-watershed. On the western side of the Snake River the sub-watershed includes the town of Roberts, Market Lake Wildlife Management Area, Kettle Butte and associated drainages, and Kettle Butte Drain. Also included are the Butte Market Lake Canal, Taylor Slough, Bell Larsen Canal, Poitevin Ditch, and McCarthy Ditch.

Sand Dunes (17040201-04)

This sub-watershed includes an area of lava rock and sand dunes north of the Menan Buttes. There are practically no surface waters associated with this sub-watershed with the exception of some minor drainage (probably intermittent or ephemeral) associated with Big Grassy Ridge.

South Fork Snake River (17040201-05)

This sub-watershed includes that portion of the South Fork Snake River from an area south of Sunnydell to the Henry's Fork. Included are portions of Dry Bed and various other canals and sloughs on the south side of the Snake River. On the north side of the Snake River are Texas Slough, Liberty Park Canal, Spring Slough, Bannock Jim Slough, and other canal works.

Sunnydell Canal (17040201-06)

This sub-watershed includes minor drainages to the Sunnydell Canal in an area south of Rexburg to Byrne.

Heise (17040201-07)

The Heise sub-watershed includes that portion of the South Fork Snake River from the HUC boundary (near Stinking Spring Canyon) to Sunnydell. This region contains the primary diversions for Dry Bed, Enterprise Canal, Farmers Friend Canal, Eagle Rock Canal, and Anderson Canal. On the north side of the Snake River are the natural drainages of Kelly Canyon and Lyon Creek.

Birch Creek (17040201-08)

The Birch Creek sub-watershed contains only the 303d-listed Birch Creek and associated tributary drainage. Birch Creek originates near the divide between Antelope Creek and Meadow Creek north of Mt. Baldy of the Caribou Range. Birch Creek ends as a sink on most maps just south of the Anderson Canal. Spring high flows probably reach and discharge to the canal. The upper watershed is predominantly mountain brush vegetation that is used for grazing purposes (see photographs in Appendix B). Birch Creek passes through two sections of state lands in the upper watershed. The lower watershed is predominantly dryland agricultural usage. The majority of the lands surrounding Birch Creek are privately owned.

Ririe/Ucon (17040201-09)

This sub-watershed includes the major canals of Enterprise, Harrison, Farmers Friend, Eagle Rock, Anderson, and Willow Creek from Ririe to an area southwest of Ucon. Also included are drainages (probably ephemeral or intermittent) from an area known as Iona Hill. On Figure 8 this sub-watershed is shown to terminate at the divide of the North Fork and South Fork Willow Creek. In actuality the boundary is at the division of Willow Creek and Sand Creek, both of which are now controlled exclusively as irrigation water canal structures.

Taylor Mountain (17040201-10)

This sub-watershed includes Taylor Creek and Henry Creek that drain from the Taylor Mountain area to an area of irrigation diversion south of Ammon. Also included are a number of smaller (ephemeral or intermittent) drainages, such as Black Canyon, Eucher Valley, and Rock Hollow, which drain Galbraith Hill and the south side of Iona Hill. Canal works such as Gardner Canal and Hillside Canal captures most if not all of these drainages.

Stream Characteristics

The Snake River in this subbasin exists on a Pliestocene outwash floodplain of flood and terrace gravels. As such, the floodplain is very porous and probably includes substantial ground water flow. Very few surface tributary streams exist in this subbasin. Kelly Creek, Birch Creek, and, at one time, the lower end of Willow Creek were the primary perennial streams resulting from higher elevations. BLM assessments and proper functioning condition ratings for streams in this subbasin are found in Appendix C.

Birch Creek is a low order, moderately sinuous perennial stream with predominantly a Rosgen channel type B. Although, the lower portion of this stream is deeply incised as a result of increased hydrology from constriction between dryland agricultural fields and a road, as well as increased runoff from both (see Photographs in Appendix D).

1.3 Cultural Characteristics

The northern and western portions of this subbasin are in sagebrush-steppe rangeland. Because of the nature of the geology and soils (wind blown deposits over basalt lava flows many feet thick) in this area, no surface drainage exists. The remaining portions of the subbasin are largely flat Snake River plain that has been converted to agriculture. Its predominance as an agricultural center is what makes Idaho Falls the third largest city in the state.

Land Use

The land use in the subbasin is primarily agriculture (see Figure 4), with the central region adjacent to the Snake River utilizing gravity flow irrigation (23% of total land area), surrounded by sprinkler type irrigation (25%) and dryland farming (14%). Thirty percent (30%) of the land area is used for rangeland, and 1.4% is in urban uses. The remaining lands (6.6%) are in forest, riparian or bare rock (lava flows). [Note: urban area east of Idaho Falls on Figure 4 is a typographical error, and does not exist.]

Land Ownership, Cultural Features, and Population

The majority (69%) of the land in the Idaho Falls subbasin is in private ownership (Figure 6). The Bureau of Land Management (BLM) manages the majority of the western and northern shrubland areas, constituting 25% of the subbasin. A small portion of the Idaho National Engineering and Environmental Laboratory (INEEL) managed by the Department of Energy (DOE) occurs at the westernmost point of the subbasin. Additionally, there is one very small piece of land in the upper Kelly Canyon area that is administered by the USDA Forest Service (Caribou-Targee National Forest).

The State of Idaho owns several section 16 blocks throughout the BLM lands as well as the Market Lake Wildlife Management Area, the upper Lyons Creek watershed north of Kelly Canyon, upper Birch Creek, and a large number of sections north of the St. Anthony Sand Dunes.

The Idaho Falls subbasin extends from Fremont County to the north, through Jefferson and Madison Counties, and then Bonneville County in the southern portion. Small portions of Bingham County occur at the southern and western tips, and small portions of Clark County occur at the northern tip. The Idaho Falls subbasin includes the cities and towns of Idaho Falls, Roberts (647)[1], Menan (707), Lewisville (467), Rigby (2,998), Ririe (545), Ucon (943), Iona (1,201), Ammon (6,187), and a portion of Rexburg. The city of Idaho Falls had a population of 50,730 in 2000 (IDC, 2001). Population densities by county vary from 0.46 –

[1] Numbers in parentheses are 2000 population estimates from the Idaho Department of Commerce (IDC, 2001).

10.41 population per square mile (pop/sq mi) in Fremont County to 40 – 50 pop/square miles in Bonneville County (Figure 7).

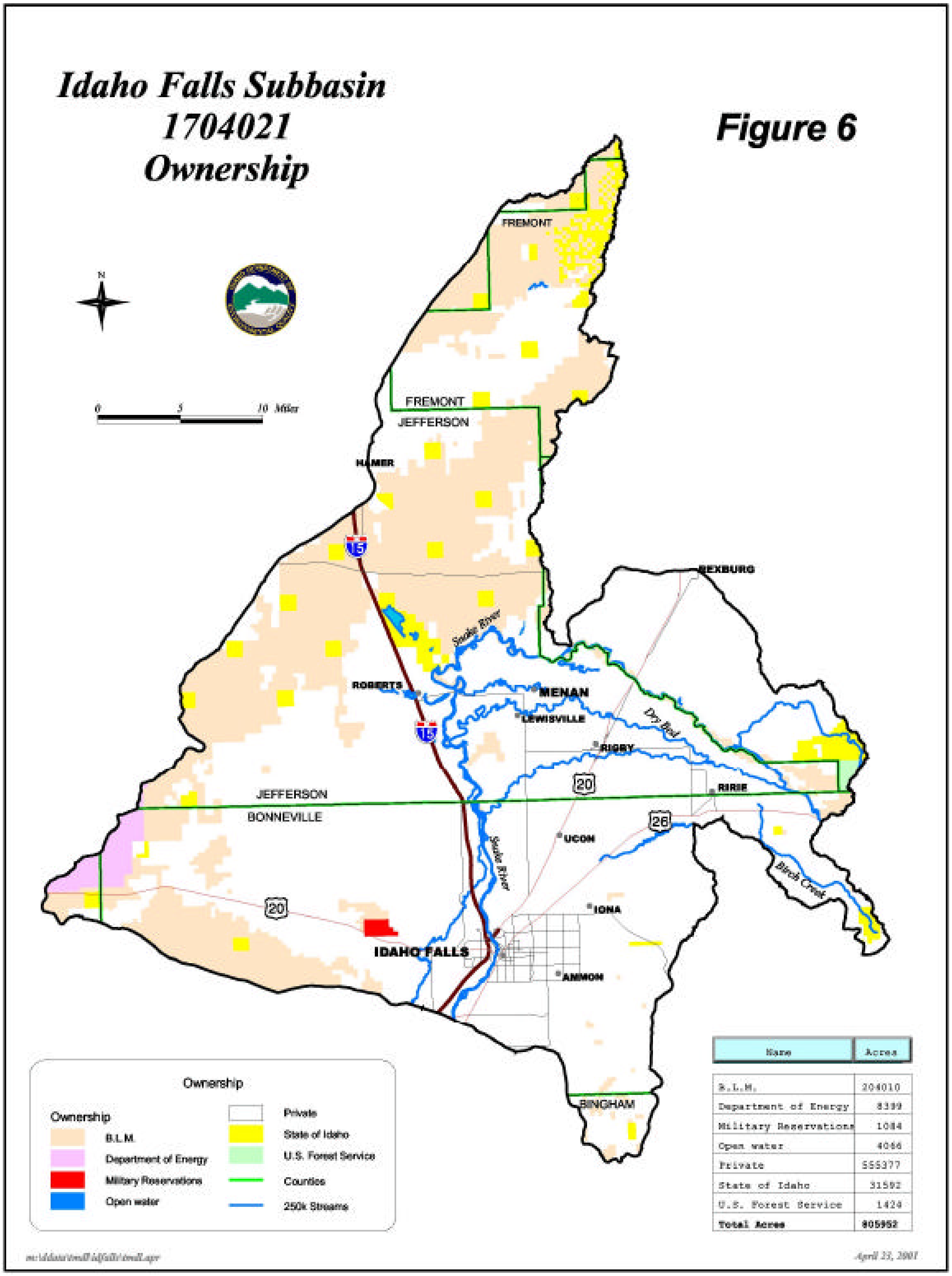
History and Economics

The history and economics of this subbasin are closely tied to its major city Idaho Falls. Idaho Falls is the state's third largest city and a major center for agricultural products, farm service, and, because of it's proximity to the Idaho National Engineering and Environmental Laboratory (INEEL), science and technology. The U.S. Department of Energy and its contractors at INEEL all maintain office complexes in the city. Most of the state's major universities maintain branch campuses in Idaho Falls. Idaho Falls also has an important recreational and tourist economy due to its proximity to Yellowstone and Grand Teton National Parks.

Idaho Falls' roots are closely tied to the surrounding farmland on the upper Snake River plain. This area is well known for its production of russet potatoes, livestock, wheat and other small grains. Most of the lowlands are irrigated with water from the Snake River and surrounding wells. Higher elevations that receive sufficient snowfall are largely in dryland agriculture. The major diversion structures and canals include Sunnydell Canal, Dry Bed, Burgess Canal, Rudy Canal, Harrison Canal, Anderson Canal, and Willow/Sand Creek Canal on the east side, and Market Lake Canal, McCarthy Ditch, and Great Western Canal on the west side of the subbasin. Many of these irrigation systems have been in place since the turn of the Twentieth Century, although probably modified, repaired and replaced several times throughout that century.

A dam near the falls in Idaho Falls is used to shunt a portion of the Snake River through a powerhouse to generate electricity for the city. The subbasin also contains four municipal NPDES wastewater discharges, two of which discharge to the Snake River and two discharge to the Dry Bed canal system (see Section 3).

Figure 6. Idaho Falls Subbasin Land Ownership.



Name	Acres
B.L.M.	204010
Department of Energy	8399
Military Reservations	1084
Open water	4066
Private	555377
State of Idaho	31592
U.S. Forest Service	1424
Total Acres	**805952**

Figure 7. Idaho Falls Subbasin Population Estimates.

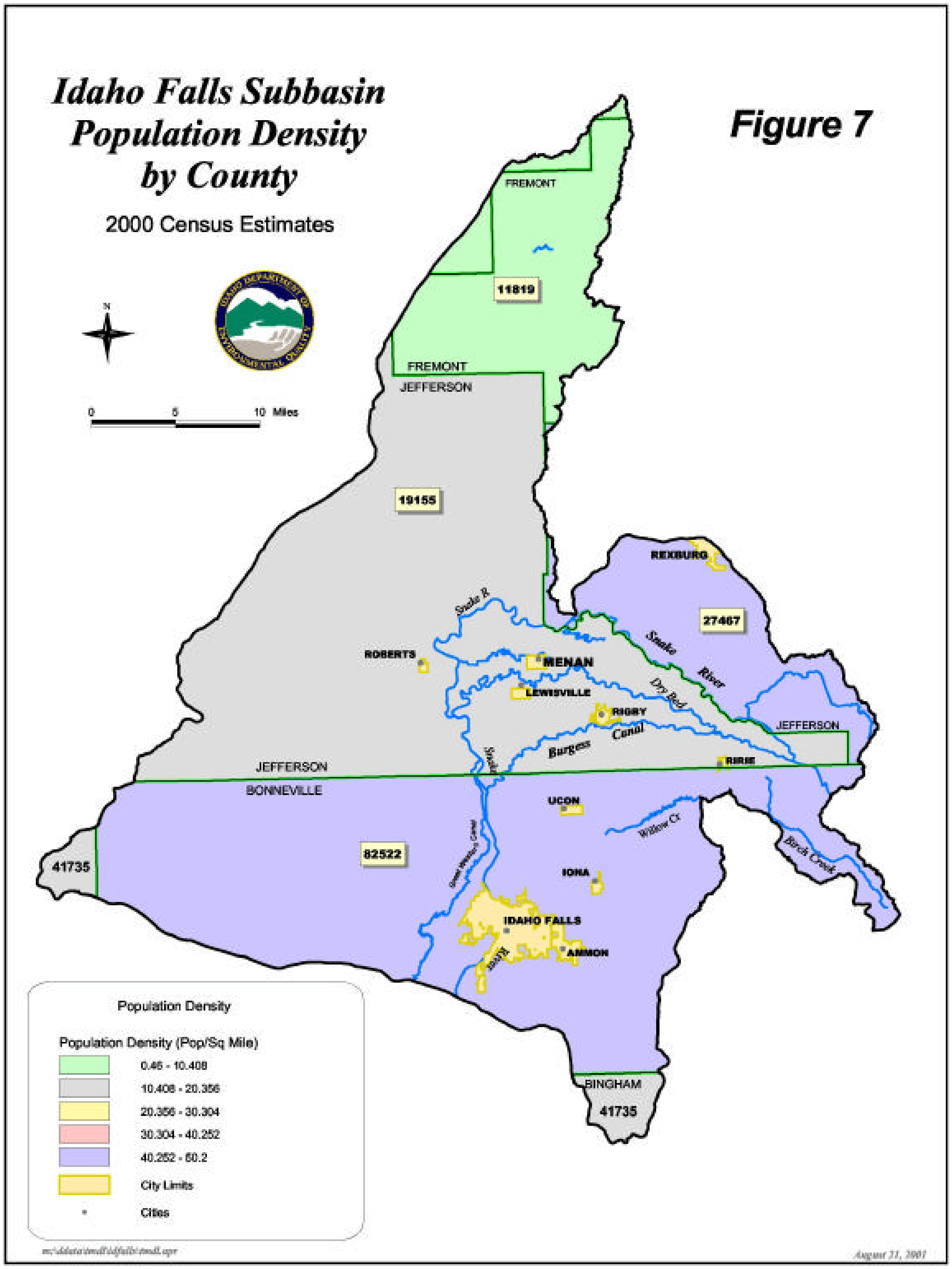


Figure 8. Idaho Falls Subbasin Hydrology.